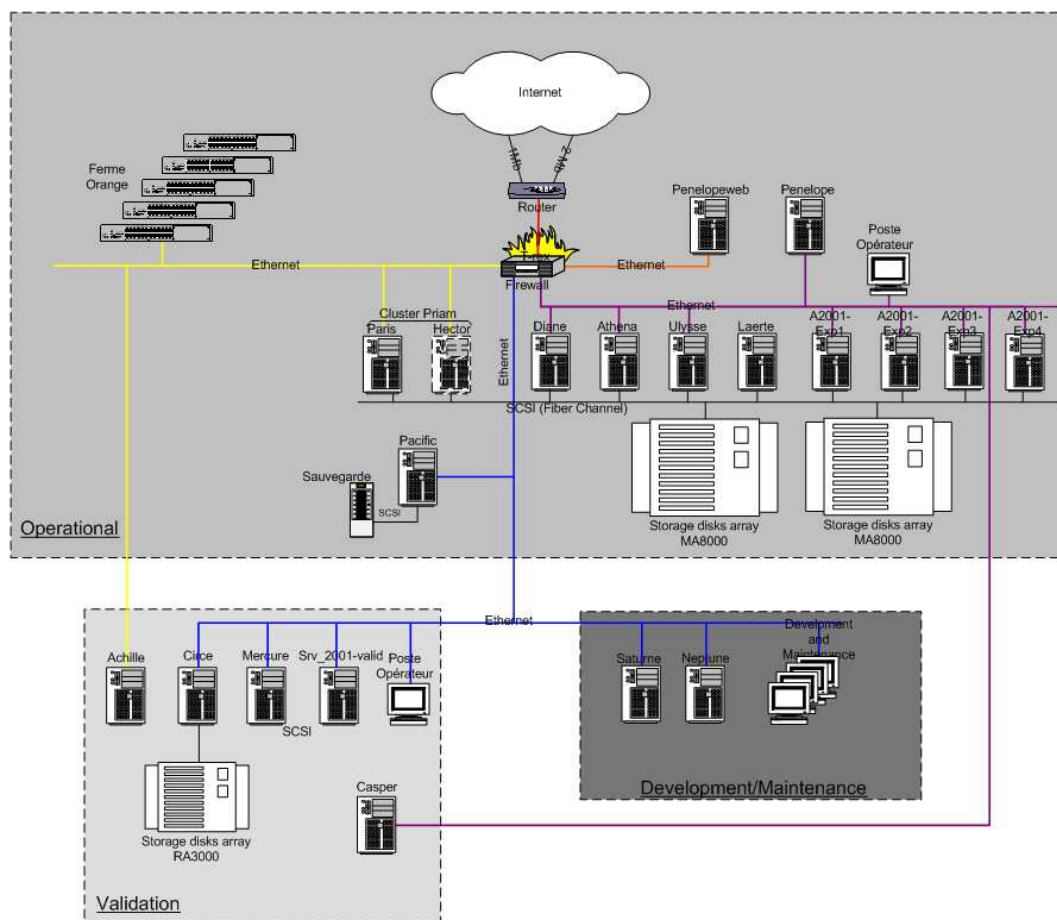## SYSTEM IMPROVEMENTS

1. Hardware configuration

The computing architecture dedicated to the Argos system is steady. A few words to remind the principle of the Argos computing centre architecture.

In the middle of the architecture, there are two high performance SAN disk storage arrays on which are connected, via fiber channel links, the servers involved in the processing of the Argos data.

The operational configuration is dedicated to the acquisition, the processing and the dissemination of the Argos data, 24 hours a day, all along the year. In 2008, all the old OpenVMS servers, which still existed, have been discarded. Today, it means that all the Argos servers run on Linux and Windows (a few).

The development and the maintenance of the Argos software are performed on a

dedicated architecture. The third configuration, the validation configuration, is used to validate all the software modifications and corrections before being installed at the level of the operational configuration.

2. Ground segment architecture

The Argos ground segment is composed as follow :
- the delayed time acquisition network
- the real time acquisition network
- the Global Argos Control and Processing centre
- the PTT and PMT
- the regional processing centers

2.1 The delayed time acquisition network

It is composed of the two NOAA global stations (Fairbanks, Wallops island) for the acquisition of the NOAA satellites data and the Eumetsat antenna (Svalbard) for the acquisition of the Metop and NOAA-18 data.

2.2 The real time acquisition network

No station joined the Argos network during 2008. However, 56 stations compose this network which represents a very good coverage of the earth. For DBCP needs, it should be interesting in covering the south part of the Indian Ocean as well as the middle of the Atlantic Ocean. These are very remote areas where it is difficult to find sites and infrastructures. The possibility of using the site of St Helena has been abandoned (no band-L station exists and very poor communication links). A contact has been taken with US Navy in Diego Garcia.

Argos real time acquisition network

Most of the ground stations which compose the Argos network are only capable of acquiring data from NOAA satellites. This is the reason why we wanted to focus our efforts on adding new ground stations compatible with NOAA and METOP satellites.

Unfortunately, in July 2007, the failure of METOP-A HRPT transmitter stopped the implementation of this network. Despite the restart of the transmitter over the North Atlantic in 2008, the ground stations owners decide not to invest in the upgrade of their station. CLS bought and installed two NOAA/METOP stations (Lima, Hatoyama) which are only used for the NOAA satellites.

In the aim at preparing the future, CLS has continued to negotiate with Eumetsat in order to be connected to the EARS network. This connection is effective since March 2009. On another side, CLS initiated, with the help and the cooperation of CNES, the upgrade of the Argos ground stations network so that a part of the stations can acquire data issued from NOAA, METOP, SARAL and NPOESS satellites. The network must be dense enough to deliver data to users as rapidly as possible.
A number of tasks must be completed to develop a ground station network that meets the above criteria.

1. **System design studies and engineering**
   - ✓ Studying the existing network
   - ✓ Identifying applications where data delivery time is a particularly sensitive issue
   - ✓ Identifying geographical areas requiring priority coverage
   - ✓ Defining the optimum network to be set up to meet requirements
   - ✓ Defining the station network upgrade strategy
   - ✓ Identifying stations qualifying for upgrade
   - ✓ Studying these stations (in terms of upgradability)
   - ✓ Conducting negotiations with the owners of these stations.

2. **NOAA/METOP/SARAL/NPOESS receiver development**
   - ✓ Taking the CNES feasibility study and making any necessary adjustments
   - ✓ Selecting the upgrading contractor
   - ✓ Negotiating the upgrading contract
   - ✓ Monitoring upgrading work
   - ✓ Conducting test, validation and acceptance activities.

3. **Upgrading the three CLS stations ("Konsberg")**
   - ✓ Implementing the new receiver
   - ✓ Implementing the new station control software
   - ✓ Conducting test, validation and acceptance activities.

4. **Upgrading non-CLS stations (about eight)**
   - ✓ Eight is an approximate figure and must be confirmed during the first-phase system study.
   - ✓ This activity comprises the following tasks:
     - Procuring a receiver
     - Upgrading the station control software
     - Implementing the new receiver

- Implementing the station control software
- Conducting test, validation and acceptance activities.

5. **Procuring and installing new ground stations (around two)**
   ✓ Two is an approximate figure and must be confirmed during the first-phase system study. The new stations, which will join the existing network, will be installed in spots where they are most likely to improve performance for users (geographical coverage, density of beacons in area, real-time advantages, etc.)
   ✓ Issuing the invitation to tender, selecting the contractor and negotiating station procurement contracts
   ✓ Preparing installation sites
   ✓ Installing the stations
   ✓ Conducting test, validation and acceptance activities.

With the help and support of CNES, the Argos station upgrade project is now a reality. A CLS-led project incorporating tasks 1, 2 and 3 described above was started in May 2009 and should be completed by July 2010. A detailed review and in-depth examination of operating feedback will then be carried out before commencing tasks 4 and 5, which are scheduled for completion in time for the launch of SARAL. We will then have a network of stations capable of handling NOAA, METOP, SARAL and NPOESS satellite data.

2.3. Argos Control and processing centre

The last phase of the project Argos 2001 was finished and opened to the users in May 2008. Argos 200 consisted in renewing all the hardware and software components of the Argos Control and Processing centres. The purpose of the Argos 2001 project was vital for the long-term continuity of the Argos system and needed to offer a better level of services to our users in terms of new functionalities, reliability, availability and responsiveness to their requests.

2.4 PTT/PMT for users

The Argos-3 instrument generation allows users to have a two-way communication as well as a better control of uplinks at a higher data rate. To access to these new facilities, users have to implement a PMT (Platform Message Transceiver) in place of their current PTT.
This module, working as a modem, supports:
- transmission of uplink messages using several possible modulation links as well as satellite pass predictions
- reception and processing of downlink messages (commands, predefines messages, satellite acknowledgement,…).
- Communication with the platform for the acquisition of sensors and the delivery of an acknowledgement when data string has been correctly transmitted and acknowledge by satellites.

Today, two manufacturers, Kenwood and Elta, successfully fulfilled the certification process and delivered their final product version in December 2007. This development has reached its goals in terms of product definition and constrains (size, consumption,..) as well as on the cost.

Elta PMT RFM

Kenwood PMT RFM

The first 500 Kenwood PMT units have been received by CLS in May 2008.

In order to convince users and manufacturers to use these PMTs and the Argos-3 functionalities, it has been decided, with the help and the cooperation of CNES, to create an Argos-3 implementation plan.
The objectives of this project are:
1. To know and control the Argos-3 system
2. To promote the Argos-3 system

In terms of organization, the project is split into two distinct and consecutive phases.
A first phase, called Evaluation phase, intended for:
- knowing and controlling the system by deploying a network of Argos-3 reference platforms
- pointing out, from a user point of view, the advantages and the disadvantages of the system
- getting all the elements to objectively promote the system
- developing Argos-3 platforms prototypes which are representative of the user applications in order to validate optimized usage scenario of transmission and take advantage of the new Argos-3 functionalities
A second phase, called Promotion phase, intended for:
- making aware, encouraging, involving and convincing both users and manufacturers to use the Argos-3 system
- developing, from the return of experience got with the Argos-3 platform prototypes, operational user platforms (Argo floats, drifting buoys, animal platforms). It means development contracts signed with manufacturers.
- making available for the users these platforms in order to include them in defined pilot projects
- following up these Argos-3 platforms during a significant period (about 9

months) and comparing their performances with the Argos-2 ones of the same program
- organizing an Argos-3 forum where will be presented to the Argos user community the results of the promotion phase.

First phase is now quite over while the second phase should start before the end of 2009.

2.4 Regional processing centers
The Peruvian centre is the only Argos regional centre to be still alive.

A new concept of Argos regional processing center has been developed by CLS in order to offer a solution to the users who wish to be autonomous and not to depend on the global processing centers.